AUDIENCE STRUCTURE AND CATEGORY SYSTEMS IN MARKETS*

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Abstract

Research in the sociology of markets finds that schemas and category systems in markets provide frameworks for perceiving and evaluating products and producers, thus making valuation and exchange possible. These meanings need to be shared by market participants to create order. This raises the question: How do consensual schemas and category systems emerge and develop? In this paper, we theorize about two processes through which audiences in markets converge on meanings and reach extensional and intensional consensus around market categories: a process of interaction among the mass audience and a process of the vanguard influencing the mass audience. We develop a formal theory for these two processes which lead to implications for how structure of the audience affects language elaboration and category differentiation. We test these implications using data on 23 market categories in eBay. We find that interaction in the mass audience is associated with language use but not category differentiation. We find that the prevalence of three kinds of vanguard we study - activists, insiders, and enthusiasts - is associated with category differentiation, while the prevalence of insiders increases language elaboration.

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Introduction

Research on the sociology of markets points to several avenues through which consensus about category systems in markets can emerge and develop. Much of this work highlights the leading role of producers. Producers create classificatory schemes in defining themselves and their rivals (White 1981; Podolny 1993; Porac, Thomas, Wilson, Paton, and Kanfer 1995; Kennedy 2005; Rao, Monin, and Durand 2003; Negro, Hannan, and Rao 2008), form interest groups and associations to establish quality standards tied to categories (Bogaert, Boone, and Carroll 2006), and lobby governmental authorities to officially recognize certain classification systems (Zhao 2005).

Other studies highlight the role of other kinds of actors. Influential market intermediaries, such as critics, reviewers, and analysts, theorize and elaborate category schemas (Becker 1982; Shrum 1996; Lounsbury and Rao 2004; Rosa and Spanjol 2005). In interpreting and evaluating producers and products, they disseminate and reinforce their categorical frameworks to the larger audience (Zuckerman 1999). They also imbue categories with differential legitimacy through their coverage patterns (Hilgartner and Bosk 1988; Hsu 2006).

Research in marketing argues that consumers can also play a role in codefining product categories Day, Shocker, and Srivastava (1979). For instance, Rosa, Porac, Runser-Spanjol, and Saxon (1999) analyze the emergence of agreement on category labels in the emerging market for minivans as an instance in which consumers and producers jointly enacted product categories in an interactional process of sensemaking.

Together, these various lines of research suggest that category systems emerge not just from the actions of those playing different market roles, but also through different processes. In some cases, market actors seek explicitly to promote particular category schemas. For example, producers' early efforts to establish a market often take the form of a social movement with activists disseminating product schemas to consumers (Carroll and Swaminathan 2000). Likewise critics and regulators often attempt to educate the wider audience about the meanings of categories. In other cases, the emergence of a category results from ordinary interaction in the market—from efforts of agents to make sense of the market landscape and to share their understandings (Rosa, Porac, Runser-Spanjol, and Saxon 1999).

We integrate themes in this research by analyzing two processes that drive the emergence of (consensual) categorical distinctions in markets. In the first, labels and schemas emerge and get elaborated through day-to-day interactions among market actors. We argue that a convergence of meanings of labels in the mass audience results from extensive engagement in the activities that relate to a (potential) category.

The second is a process involves influence—the mass audience follows an activist subset of the audience (which we call a vanguard) and converges to their categorical understandings. We pay particular attention to three kinds of sub-audiences that can assume the role of a vanguard: “activists" (who engage intensely in the market), “enthusiasts" (who display symbolic identification with the market), and “insiders” (who play both producer and audience roles).

For both processes of interaction and influence, we analyze how the structure of the audience might shape the development of categories. We rely on the assumption that the meanings of labels—whether initiated by producers, intermediaries, or consumers and whether developed through bottom-up or top-down processes—must be shared by a large proportion of the audience to shape order in a market.

Consensus about the meanings of types of products and types of producers makes valuation and exchange possible (Espeland and Stevens 1998; Carruthers and Stinchcombe 1999; Favereau, Biencourt, and Eymard-Duvernay 2002; Porac, Ventresca, and Mishina 2002; Biggart and Beamish 2003; Zuckerman, Kim, Ukanwa, and von Rittman 2003). Consensus about the meanings of types also facilitates coordinated activities among diverse actors and reduces their costs (Becker 1982). For example, Rosa et al. (1999) argue that agreement among market actors on how specific products are categorized stabilizes the market by facilitating information flows. Conversely, divergence in understandings contributes to volatility and variations in business cycles over markets (Shiller 1990; Zuckerman 2004).

In the following sections, we propose a formal theory that represents arguments about these two mechanisms. The theory seeks to explain (1) the advantages to producers of also participating in the market as buyers, (2) the proliferation of labels, and (3) the elaboration of meaning as reflected in differentiation of subcategories. We then describe our empirical study, which moves beyond previous studies of market formation that focus on one or two markets (Rosa et al. 1999; Kennedy 2005; Rosa and Spanjol 2005) by examining multiple market categories using data on eBay auctions. We conclude with a discussion of the implications of our findings.

Markets, Categories, Audiences

Our formal theory builds on Hannan, Pólos, and Carroll’s (2007) (hereafter HPC) theory of category evolution. This theory considers domains (culturally bounded slices of the social world, such as agriculture, art, finance, medicine, and sport), a minimal structure consisting of a pair of roles—producer and audience member—and a language for telling what these roles mean and what kinds of types there are. In a market context, the producer role involves creating the goods and services that characterize the market (within a bounded region of social space). The audience role involves inspecting, evaluating, and consuming the output of the producers. As the market develops, these roles and the language that articulates what it means to occupy them get elaborated.

For purposes of analytical clarity and simplicity, we consider only a single focal audience (whose membership we denote by **a**). All definitions, postulates, and theorems should be interpreted as applying to this audience. Therefore, we will not constantly refer to the segment in formal definitions and propositions. In parallel, we denote the set of producers as **p**.

The development of a language in a domain reflects efforts by audience members to make sense of producers and their offerings by constructing and elucidating distinctions. Producers perceived as similar are grouped together and tagged with a common label. In the eyes of audience members, these producers belong to a common *type*. Yet audience members often detect shades of difference in the degree to which individual producers merit a label.[1] Type boundaries are frequently vague or fuzzy.

A key issue is the degree of agreement in an audience about their fundamental properties of types. We find it useful to conceptualize this agreement in two ways: as agreement about the application of labels to producers/products in the market and about what the labels mean. Considerations about what objects should bear a label—and to what degree—involves what logicians and linguistics call extensional issues. (The extension of a label refers to the set of objects that it denotes, not to be confused with "brand extension" in marketing.) Analysis of the emergence of categories draws attention to the degree of extensional consensus in an audience, the degree of agreement about labeling.

Individual members of an audience generally differ in how closely they approximate a consensus. This idea points to the potential value of defining audience members' grades of membership in a consensus about the scope of application of a label. The fuzzy membership of an audience member in a consensus about applicability of a label, in notation $\nu_{e(l)}(y,t)$, can then be defined as

[1] A long tradition of research in cognitive psychology and cognitive science finds that agents often detect shades of difference and decide some objects fit comfortably in a label, some do not fit at all, and others fit to a greater or lesser degree (Rosch 1975; Rosch and Mervis 1975). Marketing researchers have reached the same conclusion (Loken and Ward 1990; Hampton 1998; Viswanathan and Childers 1999).

the degree to which this agent agrees with the other members of the audience in what producers ought to be assigned the label and to what degree. Aggregating to the audience level, the strength of extensional consensus can usefully be equated to the average grades of membership in the consensus. In formal terms, this function (denoted by $ec(l, t)$ equals the average over the audience of $v_{e(l)}(y, t)$.

It is helpful to have a term that distinguishes labels by degree of extensional consensus. HPC use the term class to indicate a label for which the audience has reached a high levels of extensional consensus. (In notation, the predicate $\text{CLASS}(l, t)$ reads that the label l is a class (to the unspecified audience) at the time point t.)

The second relevant kind of agreement concerns the meaning or *intension* of a label. Research in cognitive science generally equates meanings with schemas (patterns of feature values that are consistent with full membership in a label). An agent's grade of membership in an intensional semantic consensus about a label, in notation $v_{i(l)}(y, t)$, is the degree to which his or her meaning of the label agrees with those of other members of the audience segment who employ the label (which in turn depends on the degree of similarity of the schemas that they pair with the label. The strength of intensional consensus is defined in parallel to its extensional counterpart—as the average of audience members' grades of membership in the intensional consensus.

A category is a label about which an audience has reached substantial agreement about meaning. (In notation, $\text{CAT}(l, t)$.) In other words, whether a label marks a category depends on whether an audience comes to agreement about application and meaning of the label.

The degree to which an audience member finds an offering appealing depends on the (perceived) fit of the offering's attributes with her category schema. An audience member's schema sets expectations for what features a category member should (and should not) have. For classes and categories that have a positive valuation in the audience, people generally prefer offerings that meet their category expectations (Griswold 1987; Zuckerman 1999). We restrict our attention to such cases, where better fit to the label yields greater expected intrinsic appeal. We use the qualifier "intrinsic" appeal to allow a distinction with the actual appeal of an offering, which presumably also depends on the degree to which the offering is made available (on the engagement of the producer with the consumers in the audience).

Intrinsic appeal is based on a complex assessment of the "offer," including the feature values of the product/service being offered and the feature values of the producer. The fuzzy-set machinery provides a nice way to represent this idea. The intrinsic appeal function (of an offering to an audience member) has the form of a grade of membership. The intrinsic appeal of a producer's offering as an instance of a label to an agent at a time point, in notation $\alpha(l, x, y, t)$, is a function that maps triples of producers, audience-segment members, and time points to the $[0, 1]$ interval. It tells the level of intrinsic appeal of the offering to the agent at that time.

In the next two sections, we develop arguments regarding how extensional and intensional consensus around market classes/categories emerge. As noted earlier, our arguments center on two types of mechanisms driven by interaction and influence, and link the structure of the audience to the development and elaboration of meaning in markets.

Convergence of Meanings in the Mass Audience

We begin with the development of consensus in an audience as a process of learning through participation in the market. Key notions here are engagement and communication. Research in the sociology of markets documents various forms of engagement by market participants. Potential buyers spend time in the market learning about producers and their offerings, evaluating and forming preferences about these offerings, and purchasing, consuming, and displaying goods (Douglas and Isherwood 1979; Smith 1989; McCracken 1990; Spillman 1999).[2] Most of these activities involve audience members communicating with others about products and producers, using labels and schema that are particular to the market.

Diverse lines of research converge in claiming and showing empirically that engagement activities involving communication among audience members facilitate the development of consensus about labels and schemas. For instance, Rosa and Spanjol (2005) argue that consumers and producers come to share product category definitions through interaction in the market, by sharing market stories. Shiller (1990) argues that popular models for evaluating speculative assets are learned through years of common discourse. And writing about the arts, DiMaggio (1987) posits that a greater degree of interaction among social groups increases the universality of systems of classifying art works and other kinds of cultural productions into genres.

[2] Audience members can, of course, engage in the market without interacting with other audience members or producers. We consider only activities by audience members that involve some, even if minimal, communication.

Engagement and Communication

We build on this key intuition that more engaged audiences are more likely to develop convergent categorical understandings. As a result, they should be more likely to construct classes and categories. We develop this part of the argument in two steps. First, we relate engagement to communication about domain related activities; then we posit that greater communication within an audience increases both extensional and intensional consensus.

To flesh out the concept of engagement as an audience member, we tie it to communication about issues pertaining to the activities associated with the label. We express this connection formally with a meaning postulate, a statement that elaborates on the meaning of engagement. This postulate states a simple monotonicity relationship between an agent's intensity of engagement as an audience member, in notation $e_a(l, y, t)$, and the level of the agent's communication about the activities associated with the label, $c(l, y, t)$. We simplify presentation of formulas stating such relations by adopting a notational shorthand proposed by HPC: $\phi \upharpoonleft \psi$ to indicate a monotonic positive relationship between the two functions. (Footnote 3 spells out how this notation works in the case of the meaning postulate that follows.)

Meaning postulate 1. *More engaged audience members normally communicate more about label-related issues.*[3]

$$\mathfrak{N}\, l, t, t', y, y' \,[e_a \upharpoonleft \mathrm{E}\{c\}].$$

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[3]The full "official" notation for this formula is

$$\mathfrak{N}\, l, t, t', y, y' \,[((e_a(l, y, t) > e_a(l, y', t')) \rightarrow (\mathrm{E}\{c(l, y, t)\} > \mathrm{E}\{c(l, y', t')\}))$$
$$\wedge\, ((e_a(l, y, t) = e_a(l, y', t')) \rightarrow (\mathrm{E}\{c(l, y, t)\} = \mathrm{E}\{c(l, y', t')\}))].$$

We also need to explain the kind of quantifier used here. The theory on which we build states (some) definitions, postulates, auxiliary assumptions, lemmas, and theorems in a nonmonotonic logic (Pólos and Hannan 2002, 2004). The formal language to represent causal stories defines a new kind of quantifier, denoted by $\mathfrak{N}$. Formulas quantified by $\mathfrak{N}$ state what is expected to be the case "normally" (as a default) according to a causal story. The normal case is what we assume to be the case if we lack more specific information that might overrule the default.

The implications of a set of rules with exceptions, called provisional theorems, are the logical consequences of a stage of a theory. Provisional theorems have a haphazard existence: what can be derived at one stage, might not be derivable in a later stage. So the status of a provisional theorem differs from that of a causal story. The syntax of the language codes this difference. It introduces a "presumably' quantifier, denoted by $\mathfrak{P}$. Sentences (formulas) quantified by $\mathfrak{P}$ are provisional theorems at a stage of a theory (if they follow from the premises at that stage).

Communicative acts orient pairs (or n-tuples) of audience members to the same offerings and to the same features of the offerings. So communication provides a common focus for attention and for efforts at sensemaking. A common focus likely makes it easier for the actors involved to come to agreement about which producers and offerings fit a focal label and to what degree. In other words, widespread communication about the players in a market and their offerings increases extensional consensus in the inter-communicating audience.

Communication requires that audience members use a mutually intelligible code to refer to the objects of their communication. An individual audience member, alone, might generate ideas about offerings in a market and create her own theories of value in trying to make sense of the market. When communicating with other audience members, however, she has to use the labels associated with the market.[4] Frequent communication leads audience members to gain fluency, to learn to use labels and understand their referents in ways that make sense to other audience members.

Postulate 1 (Extensional and intensional convergence through communication)**.** *An agent's grade of membership in an audience's extensional/intensional consensus about a label normally increases with his/her level of communication with other audience members about label-related issues.*

$$\mathfrak{N}\, l, t, t', y, y' \,[(c \uparrow \mathrm{E}\{v_e\}) \wedge (c \uparrow \mathrm{E}\{v_i\})].$$

By a straightforward application of the "cut rule,"[5] this argument implies that more engaged audience members presumably share more in both the extensional and intensional consensus and that more engaged audience segments have higher expected levels of consensus about a label.

Lemma 1. *An agent's grade of membership in an extensional/intensional consensus about a label normally increases with his/her engagement as a member of the audience for the label.*

$$\mathfrak{N}\, l, t, t', y, y' \,[(e_a \uparrow \mathrm{E}\{v_e\}) \wedge (e_a \uparrow \mathrm{E}\{v_i\})].$$

Proof. The only available rule chain linking the antecedent and consequent follows from an application of the cut rule to MP1 and P1. □

[4]In making this argument, we reflect Wittgenstein's arguments against the utility of the notion of private language.

[5]In first-order logic, $\phi \to \psi$ and $\psi \to \chi$ implies $\phi \to \chi$, with the middle term "cut out." This inference rule carries over to the nonmonotonic logic we use.

Theorem 1. *Extensional/intensional consensus in an audience about a label increases with average audience engagement.*

$$\mathfrak{P}\, l, t, t', y, y' \left[(\bar{e}_a \upharpoonright \mathrm{E}\{ec\}) \wedge (\bar{e}_a \upharpoonright \mathrm{E}\{ic\})\right],$$

where $\bar{e}_a(l,t) = \sum_{y \in \mathbf{a}} e_a(l,y,t)/|\mathbf{a}|$.

Proof. This result follows from summation over audience members of the rule chain supporting L1 and the definition of the strength of an intensional consensus as equivalent to average of grades of membership in the intensional consensus across all audience members, as given in D6. □

Elaboration of a Language

We next consider the effect of average engagement by the audience on the development of shared meaning in markets. Ethnographic studies document that markets often develop idiosyncratic languages. Smith (1989) claims that members of many auction markets speak in jargon or use signals that are obscure to outsiders. Knorr-Cetina and Bruegger (2002) show that traders in global currency markets use a particular conversational system to transact on an electronic interface. Consideration of the labels used and the schema associated with them provides a useful way to characterize the rudiments of an audience's language for a market category. With this notion, the elaboration of a language for a category can be identified with the diversification of agreed-upon names and labels and associated meanings within a category.

Language diversification likely reflects both extensional and intensional consensus. Audience members must first agree on fundamental properties at the "higher" level of the class or category before they can converge on mutually intelligible language at more specific levels. Lack of agreement about which producers belong to the class/category as well as about what patterns of features indicate membership fosters confusion and dispute about what further distinctions within a class/category, hindering development of agreed upon terms. Dissensus also means that audience members cannot assume that others will understand how to interpret their usage of specific labels and understand what they are attempting to communicate. This further discourages refinement of the class/category language.

Instead of attempting to characterize the properties of market languages, we focus on one simple and easily measurable aspect: the size of the sets of proper names and labels for clusters of producers and offerings. We accordingly predict that audiences with greater extensional and intensional consensus will generally use more proper names and category-specific labels. And we introduce a function $\lambda(l,t)$ that tells the degree of elaboration of a specific language for the activities associated with the label l at a time point. That is, if $\lambda(l,t) > \lambda(l',t')$, then the audience for the market uses more names and labels for activities associated with the label l at time t than for label l' at t'. The intuition that agreement about the meaning of a label promotes elaboration of the language associated with it is instantiated as follows.

Postulate 2. *Elaboration of a specific language for the activities associated with a class label normally develops with the degree of extensional/intensional consensus about the meaning of the label.*

$$\mathfrak{N}\, l, t, t', y, y'\, [(ec \uparrow \mathrm{E}\{\lambda\}) \wedge (ic \uparrow E\{\lambda\})],$$

It follows from the foregoing argument that high average levels of audience engagement encourages more specifics of the language to be deployed in market exchange.

Theorem 2. *The degree of elaboration of a specific language for the activities associated with a class label presumably increases with the average level of audience engagement with the label.*

$$\mathfrak{P}\, l, t, t', y, y'\, [\bar{e}_a \uparrow E\{\lambda\}].$$

Proof. The only available rule chain is a cut rule applied to (the rule chain behind) T1 and P3. □

This implication of the theory is consistent with Hume's (1854[1752]) argument for the realm of art that those more experienced with art works and genres can make finer distinctions among them. Sustained engagement as audience members allows these experienced members of the audience to develop greater awareness of the myriad details associated with the production, display, and interpretation of art works (Becker 1982). Theorem 2 holds that a similar dynamic characterizes market contexts: more-engaged audience members develop more refined distinctions among offerings and of the patterns in feature values associated with the label. And as engaged members communicate with others about the category and develop greater consensus about meanings, these audience members can discuss producers and offerings in more specific detail.

We emphasize the pathway through extensional and intensional consensus (rather than a more direct individual-level path where engagement leads to more complex schemas at the agent level and thus to more elaborate language use), because we assume that the common language observed among audience members becomes more complex only when there is a high degree of convergence in understandings. We thus regard communication as a key element in the deployment of an elaborated language; consensual refinement of a class or category language likely occurs only when audience members converge on a common general understanding of the class/category through communicative acts.

Differentiation of Subcategories

A closely related and important form of the elaboration of a language for a label is the development of agreement about subclasses and subcategories. These finer typifications emerge when audience members perceive distinct clusters of producers nested within a larger class or category label, label them, and come to agreement about their meaning. Let the term subclass refer to a nested label about which audience members have a high degree of extensional consensus and subcategory refer to a nested label characterized by high degrees of both extensional and intensional consensus.

Definition 1 (Subclasses and subcategories)**.**

A. Subclass:

$$\textsc{subcl}(l, l', t) \leftrightarrow \textsc{class}(l, t) \wedge \textsc{class}(l', t) \wedge \forall x, y\, [\mu_{e(l)}(x, y, t) \geq \mu_{e(l')}(x, y, t)];$$

B. Subcategory:

$$\textsc{subcat}(l, l', t) \leftrightarrow \textsc{cat}(l, t) \wedge \textsc{cat}(l', t) \wedge \textsc{subcl}(l, l', t).$$

Definition 2 (Hazards of formation of subclasses and subcategories)**.**

Let $N_{scl}(l, t) = |\{l' \mid \textsc{subcl}(l, l', t)|$ and $N_{scat}(l, t) = |\{l' \mid \textsc{subcat}(l, l', t)|$.

A. The hazard of subclass creation:

$$h_{cl}(l, t) = \lim_{\delta \downarrow 0} \Pr\{\{N_{scl}(l, t + \delta) - N_{scl}(l, t) = 1\}/\delta;$$

B. The hazard of subcategory creation:

$$h_{cat}(l, t) = \lim_{\delta \downarrow 0} \Pr\{\{N_{scat}(l, t + \delta) - N_{scat}(l, t) = 1\}/\delta$$

Again we argue that extensional and intensional consensus provide key foundations for the development of consensual subclasses and subcategories. Without high levels of either, audience members are likely to become bogged down in disputes about what are the meaningful subtypes.

Postulate 3. *The hazard of subclass creation normally increases with the level of extensional agreement in the audience.*

$$\mathfrak{N}\, l, l', t, t', y, y' \,[ec \uparrow h_{cl}].$$

Postulate 4. *The hazards of subclass and subcategory creation normally increase with the level of intensional agreement in the audience.*

$$\mathfrak{N}\, l, l', t, t', y, y' \,[(ic \uparrow h_{cl}) \wedge (ic \uparrow h_{cat})].$$

As we noted above, more engaged audience members generally detect and code finer shades of variation within classes and categories. It follows from the foregoing argument that differentiation of subtypes will increase with audience engagement.

Theorem 3. *The hazard of subclass/subcategory creation in a class or category presumably increases with the average level of audience engagement in the activities associated with the label.*

$$\mathfrak{P}\, l, l', t, t', y, y' \,[(\bar{e}_a \uparrow h_{cl}) \wedge (\bar{e}_a \uparrow h_{cat})].$$

Proof. The only available rule chain comes from a cut rule applied to the rule chain supporting T1 and P4 and P5. □

The Role of the Vanguard

To this point the only form of audience structure that we have considered is gradations in engagement and associated levels of communication that account for a process of convergence in meanings through interaction by the mass audience. Next we consider role differences within the audience. In particular, we discriminate a vanguard from the mass of the audience. We propose that the existence of a large and vibrant vanguard influences the mass audience and facilitates convergence in meanings.

Rosa and Spanjol (2005, p. 200) argue that market actors are more influential than others in the production of a collective understanding of category systems through shared market narratives:

> Although most market actors rely to varying degrees on market stories, only a few produce the stories. Research ... in diverse product domains such as health foods, motorcycles, and skydiving has shown that not all market actors tell coherent stories about products, even though storytellers and non-storytellers behave in almost

> identical ways in terms of consumption. In most markets, a subset of consumers articulate stories about the reasons for and purposes of consumption, whereas others are content to adopt the already circulating stories.

A vanguard more likely develops subtler, more fine-grained distinctions and more elaborated schemata. Cowley and Mitchell (2003) find that more knowledgeable consumers are more likely to organize brand information by product subcategories. Rota and Zellner (2007) show that experts use as their basic-level categories ("irises," "orchids") what are the subordinate levels for novices (who view irises and orchids as "flowers").

Research in cultural sociology reveals that vanguards also take greater pains to share their observations with others and to reach consensus about how to label objects in the domain and about what the labels mean. For instance, in *Art Worlds,* Becker (1982, p. 64) emphasizes the role of the artist in influencing how works of art are perceived:

> Audiences learn unfamiliar conventions by experiencing them, by interacting with the work and, frequently, with other people in relation to the work. They see and hear the new element in a variety of contexts. The artist teaches them what it means, what it can do, and how they might experience it by creating those contexts.

Vanguards commonly influence regulators or other authorities in formalizing category systems. Barron (1998) and Carroll and Swaminathan (2000) find that early stages of category development were animated by social movements in which vanguards play a central role. For example, home brewers shaped the emergence of the modern microbrewer form. Their activities led to the formation of the Institute of Brewing Studies, which claims to speak authoritatively on the boundaries of the claimed organizational form. Zhao (2005) notes that officially recognized classifications in the wine industries of France and United States were instituted with the effort of high status producers.

We consider three types of audience members whose presence can strengthen the influence of a vanguard on the mass audience.

Definition 3 (Activists, enthusiasts, and insiders)**.**

A. Activists are much more engaged in the activities associated with the label than most audience members. In notation, the predicate $\textsc{act}(l, y, t)$ indicates that y is an activist in the audience for class l at time t; and $N_a(l, t)$ records the number of activists:

$$N_a(l, t) = |\{y \mid (y \in \mathbf{a}) \wedge \textsc{act}(l, y, t)|/|\mathbf{a}|.$$

B. Enthusiasts have their personal identities invested in the collective identity and regard engagement in the market associated with a label as not only an economic activity but also a social one. In notation $\textsc{enth}(l, y, t)$ indicates that y is an enthusiast in the audience for category l at time t; and $N_e(l, t)$ records the number of enthusiasts:

$$N_e(l, t) = |\{y \mid (y \in \mathbf{a}) \wedge \textsc{enth}(l, y, t)| / |\mathbf{a}|.$$

C. Insiders are producers of offerings in the market associated with the label who have a nonzero grade of membership as audience members for that label:

$$\textsc{ins}(l, y, t) \leftrightarrow (y \in \mathbf{p}) \wedge (e_a(l, y, t) > 0);$$

and $N_i(l, t)$ records the number of insiders:

$$N_i(l, t) = |\{y \mid (y \in \mathbf{a}) \wedge \textsc{ins}(l, y, t)| / |\mathbf{a}|.$$

We first consider the benefits that producers derive from their insider status. Then we theorize about how insiders and other members of the vanguard can influence the emergent structure in markets.

Insider Status and Intrinsic Appeal

We propose that being an active participant in the audience and fully engaging the market allows producers to make their offerings more attractive to other audience members. (This argument provides a way to validate indirectly the claim that insiders help to shape the consensus about the meaning of a category.)

Postulate 5. *Producers who are more engaged as members of the audience for a label normally adopt feature values that give them higher average grades of membership as producers of the goods and services associated with the label.*

$$\mathfrak{N}\, l, t, t', x, x' \,[(x \in \mathbf{p}) \wedge (x' \in \mathbf{p}) \rightarrow (e_a \upharpoonright \mathrm{E}\{M_i\})],$$

where $M_{i(l)}(x, t)$ denotes the average grade of membership assigned to producer x at time t by the members of the audience.

Theorem 4. *The offerings of producers who are more engaged as members of the audience for a positively-valued category normally have greater expected intrinsic appeal to the more engaged members of the audience for the category.*

Let l be a positively valued class or category at two time points: $(\text{PCLASS}(l,t) \vee \text{PCAT}(l,t)) \wedge (\text{PCLASS}(l,t') \vee \text{PCAT}(l,t'))$.

$$\mathfrak{P}\, l, t, t', x, x', y, y' \,[(x \neq y) \wedge (x' \neq y') \wedge (e_a(l,x,t) > e_a(l,x',t')) \wedge (e_a(l,y,t) \geq e_a(l,y',t')) \\ \rightarrow (\mathrm{E}\{\alpha(l,x,y,t)\} > \mathrm{E}\{\alpha(l,x',y',t')\})].$$

Proof. The relevant rule chain applies a cut rule to P6 and D4. □

The Influence of the Vanguard on Convergence of Meanings

Next we consider the influence of vanguards. We assume that (controlling for engagement of the mass audience,) an increase in the proportion of activists, enthusiasts, or insiders in an audience increases the influence of its vanguard. Their greater representation in the audience for a label generally brings them greater attention and legitimacy, and thus heightens their ability to shape how the mass audience approaches the label and its associated offerings. Clearly, markets vary in the prevalence of vanguard. Becker (1982) describes audiences such as that of opera and ballet where a majority of audience members are also producers and a lot of them are enthusiasts. Conversely, few consumers of computers produce them, and few consumers of kitchenware are enthusiastic participants in the market.

Let $\iota(l,t)$ denote a function that records the influence of the vanguard, its ability to shape the views of the members of the mass audience, for the label l at time t.

Meaning postulate 2. *The influence of the vanguard in an audience about a label increases with the prevalence of activists, enthusiasts, and insiders in the audience segment.*

$$\mathfrak{P}\, l, t, t' \,[(N_a \uparrow \mathrm{E}\{\iota\}) \wedge (N_e \uparrow \mathrm{E}\{\iota\}) \wedge (N_i \uparrow \mathrm{E}\{\iota\})].$$

An influential vanguard creates conditions that foster the development of consensus in the wider audience. Members of the mass audience likely assume that activists know more about the market, treat them as experts, and adopt their usage of labels and schemata. Activists are also more likely to lead public discussions of how a market should be organized, and they are more likely to be consulted by authorities. The symbolic capital of enthusiasts and the know-how of insider audiences likely give them a privileged position as well, increasing their chances of influencing the agreement among the audience.

Postulate 6. *The level of extensional/intensional consensus about a label in an audience normally increases with the influence of the vanguard in the audience.*

$$\mathfrak{N}\, l, t, t' \,[(\iota \uparrow \mathrm{E}\{ec\}) \wedge (\iota \uparrow E\{ic\})].$$

Theorem 5. *The elaboration of a category language for a label increases with the prevalence of activists, enthusiasts, and insiders in the audience segment.*

$$\mathfrak{P}\, l, t, t' \, [(N_a \uparrow \mathrm{E}\{\lambda\}) \wedge (N_e \uparrow \mathrm{E}\{\lambda\}) \wedge (N_i \uparrow \mathrm{E}\{\lambda\})].$$

Proof. The rule chain supporting this theorem joins MP2, P3, and P7. □

According to our argument, categories with large and vibrant vanguards will proliferate subcategories. Members of the vanguard, who pay closer attention and may engage with the products in different role capacities, generally develop more refined systems of categorization. So the influence of a vanguard ought to increase the likelihood that subclusters within classes and categories get delineated, labeled, and schematized.

Theorem 6. *The hazards of subclass creation in a class and of subcategory creation in a category increase with the influence of the vanguard.*

Let $\textsc{class}(l, t) \wedge \textsc{class}(l', t')$.

$$\mathfrak{P}\, l, t, t' \, [(\iota \uparrow h_{cl}) \wedge (\iota \uparrow h_{cat})].$$

Proof. The rule chain supporting this theorem joins MP2, P5, and P7. □

Empirical Setting: eBay Auction Markets

We test implications of our argument with analysis of data on auctions on the online auction site eBay. Goods auctioned on eBay are classified into broad categories. We use a sample of 23 diverse categories, treating each category as a market sub-domain. The categories are: “antique furniture,” “antiquities,” “folk art,” “US coins,” “digital cameras,” “camera lenses,” “dolls,” “antique dolls,” “health,” “model trains,” “Elvis memorabilia,” “drawings,” “prints,” “antique prints,” “art photographs,” “other art,” “Pokemon,” “printers,” “printer supplies,” “watches,” “antique watches,” “tickets,” and “weird stuff.” These categories were sampled to maximize variation in the degree to which items auctioned under them had symbolic value and the degree of uncertainty that audiences generally face in evaluating the items. They also vary in size, in terms of number of items auctioned and the number of buyers. Our data set includes all auctions listed under the sampled 23 categories over 17 months, from April 2000 through August 2001. Although the actual identifiers for buyers and sellers were masked, we can observe bidding and selling behavior of individuals, as well as the outcomes of auctions.

eBay sellers post items for auction under (typically) one of the categories. They describe their items in a few pages and use a one-line auction title to attract bidders to their auctions. These item titles are listed by category and the subcategories under them. Bidders can either browse titles under certain (sub)categories or can search for keywords related to what they are looking for.

We observe audience members on eBay when they bid on an item. Bidders interact with the market (at the minimum) by reading item descriptions that sellers write. They can interact with other audience members by reading feedback that buyers leave for sellers, postings on chat rooms and discussion boards, and by contributing to these fora. One-on-one interaction via eBay occurs on e-mail and is unobservable on the site.

The Structure of the Audience

We assume that the number of items on which an audience member bids is proportional to his/her level of communication about the label. Therefore, we measure *average audience engagement* at the category level by the median among bidders of the number of items bid over seventeen months.

Bidders' participation in the market varies significantly. We identify activists by the number of auctions in which they place bids. We use two measures for the *prevalence of activists* in markets. One is the proportion of bidders who bid on more than one item over seventeen months. This measure is based on a loose definition of activism, because we did not have any theoretical or empirical clue about what activism involved in each category, other than presuming that it minimally would involve repeat participation in the market. This measure ranges from 0.24 (in "other art") to 0.64 ("Pokemon") in our sample. The second measure is the proportion of all bids over seventeen months due to the most active five percent of the bidders in the category. This measure assumes that the top 5% most active audience members in each market are activists and that as the proportion of all bids that come from this segment rises, the activity levels of the activists also rises. This measure ranges from 0.21 ("weird stuff") to 0.66 ("coins") in our sample. The two measures are correlated at $r = 0.55$, indicating that they are measuring somewhat different interpretations of activism. In order to distinguish between their effects, we use them separately instead of combining them into a scale.

The second kind of vanguard is enthusiasts, those bidders that display a symbolic engagement with the market. We measure *prevalence of enthusiasts* in markets by the proportion of bidders who have eBay user IDs that make reference to the eBay category. We code eBay user IDs such as "elvis*fan," "trainman1," "print27," and "shortstop" as indicating an identification of the bidder with the collective identity of, respectively, “Elvis memorabilia," “model trains," “antique prints," and “tickets” categories. [6] This measure ranges from zero (“antique furniture,” “digital cameras,” “drawings,” “printer supplies,” “prints”) to 0.20 (“antique dolls”) in our sample.

We measure *prevalence of insiders* in markets with the proportion of bidders in the eBay category who also put items on auction in the same category over the seventeen months. It ranges from 0.02 (“antiquities”) to 0.10 (“tickets”) in our sample. Figure 1 graphs the values for each of the four vanguard measures across the categories in the sample.

[Figure 1 about here]

Outcome Variables

We measure the *elaboration of the category language* by the proliferation of proper names and labels used in describing items on auction. **For some goods, these are brand names. In the “health" category, for example, the title “Perfection Shiatsu Massager" contains a brand name, while “Total Body Massage Mat” does not. For art, the proper names used in auction descriptions are mostly artists’ names. “Cave of Storm Nymphs canvas nudes—Poynter" is an example of an item with the artist’s name in its title; “Leda & Swan Greek Mythology Nude Sexy Print" is an auction title without any proper name.** For both brand and artist names, their use in one-line titles suggests that sellers think these names convey information to prospective buyers, that they are relevant. We reason that sellers will use proper names as item descriptors only when they expect audience members to understand them.

Categories on eBay vary in the number of sub-categories nested in them. Our observations of messages posted in eBay Discussion Forums about revisions to these category structures reveal that some audience members (vanguards, presumably) get involved in the process of establishing sub-categories by making suggestions to eBay staff and giving feedback on proposed category structures. Because the number of auctions in categories is probably a driver of sub-category differentiation, we normalize our measure of sub-category differentiation by dividing the number of sub-categories by the number of auctions in each category.

[6] Because our dataset included only masked identities of bidders, we use a separate random sample of completed auctions in the same categories from eBay to code this variable. This sample of auctions matches the data that eBay provided in the variables that are common to both datasets.

In the auction level analysis on insider appeal, we use a positive outcome on an auction (making a sale) as an indication that an offering had at least moderate appeal to the audience.

[Table 1 about here]

Table 1 reports the descriptive statistics for the category-level variables we use in analyses and their correlations.

Hypotheses

Using these variables, we can re-state the implications of our theorems as follows:

Hypothesis 1 (Insider status and appeal; Theorem 4)**.** *The expected appeal of an offering increases with the seller's previous engagement as an audience member in the category.*

Hypothesis 2 (Convergence through engagement; Theorems 2 and 3)**.** *Categories with greater average engagement by audience members have (a.) more frequent use of proper names in item titles and (b.) more sub-categories per item.*

Hypothesis 3 (Convergence through influence; Theorems 5 and 6)**.** *Categories with more prevalent vanguards have (a.) more frequent use of proper names in item titles and (b.) more sub-categories per item.*

Estimation and Results

To test Hypothesis 1, we analyze data on the 41,490 auctions that ended on August 31, 2001. Because 4,693 of the 14,034 sellers involved had more than one auction ending that day (some had hundreds), we picked one auction per seller at random in each category. We estimate logit regressions of the outcome of auctions, whether they yield a sale or not. We include category dummies in these regressions to control for category-level effects. The analyses reported in Table 2 show that insiders (sellers that also engaged in the market category as bidders) were more likely to sell their items, as predicted by Hypothesis 1. The coefficient estimates in Model 2 indicate that the probability of a sale was 14% higher for insiders.

[Table 2 about here]

In testing Hypotheses 2 and 3, we use OLS regressions. Because these hypotheses apply to the category level and the data cover only 23 categories, we face an obvious problem of small sample size. We therefore perform bootstrap estimation in all analyses that bear on these hypotheses.[7] Bootstrapping increases the standard errors, and weakens the statistical significance of many of the effects of interest. In all category-level regressions, we control for the (natural logarithm) of the number of auctions held in the category and of the number of bidders that bid on at least one auction during the previous seventeen months. We intend these as controls for the size of the market.

Table 3 contains estimates of the effect of average audience engagement on label use (prevalence of proper names in auction titles) and proliferation of subclasses (ratio of subcategories to auctions). Models 1a and 2a are baseline models with control variables. In Model 1b, average engagement in the category by audience members has a significant positive effect on the use of proper names in auction titles, supporting Hypothesis 2a. In Model 2b, the effect of this variable on the proliferation of subclasses is not significant. Therefore, we reject Hypothesis 2b.

[Table 3 about here]

Table 4 reports estimates of specifications that allows tests our argument about convergence of meanings through the influence of the vanguard. The prevalence of activists as measured by the proportion of bidders that bid on multiple items over the previous 17 months increases label use and the proliferation of subclasses. Our second measure of activist prevalence in the audience, proportion of bids by the most active 5% of bidders, has a positive effect on the proliferation of subclasses, but not on label use. In supplemental analyses, we find that the results do not change appreciably when we add median average engagement to these models.

[Table 4 about here]

Estimates of Models 1c and 2c in Table 4 show that the prevalence of insiders (bidders that previously auctioned in the category) has a significant positive effect on label use and the proliferation of subclasses. The prevalence of enthusiasts (measured by the proportion of bidders with category-referencing user IDs) also increases the proliferation of subclasses, but it does not have a significant effect on label use. Thus, Hypothesis 3a is supported for insiders and partially for activists, while Hypothesis 3b is supported for all three groups of vanguard.

[7] We use the vce(bootstrap) option in Stata 10 with 50 replications.

Discussion

It has been argued that there is a dualistic relationship between cultural meaning and social structure (Mohr 1998). In this paper, we look in depth at how the structure of an audience in markets affects shared meanings in markets. We theorize that audiences in markets converge to shared meanings through widespread communication in the mass audience and by following the lead of a vanguard consisting of activists, insiders, and enthusiasts. We find evidence for both processes of convergence. In particular, the interactional process of mass communication supports language development and use while the process of vanguard influence dominates category differentiation.

On elaboration in language use, we find that higher average engagement of audiences is associated with more elaborate language use. Audiences with more insiders also have more elaborate languages. We do not find the hypothesized effect of enthusiasts and our findings on the effect of activists are mixed. That is, our evidence for the process of vanguard influence on language elaboration is not unequivocal. This pattern of findings may be explained by the fact that language use relies on the participation of a majority of the audience, that market participants use labels if they can assume that the labels will be intelligible to a large proportion of the audience. The influence of the vanguard, in this empirical context, may have been too limited to achieve widespread acceptance of labels. The fact that insiders' prevalence has a significant effect may be due to market participants that act as both sellers and buyers being better able to disseminate the labels that sellers use to describe their items.

A shortcoming of our investigation of vanguard's influence on label use is that we could not measure influence directly and had to rely on the prevalence of the vanguard as a proxy. Thus, we cannot rule out the possibility that it is the effect of activists' and insiders' consensus on the use of labels that we are observing in these results, and not their influence on the mass audience.

Our investigation of category differentiation finds that average engagement does not affect the proliferation of subcategories but the prevalence of vanguard does. This is consistent with our unsystematic observation of the public discussion around the category development process in eBay, where we see that a very small proportion of users gets involved. We suspect that the vanguard might be the driving force behind category elaboration and differentiation in markets where critics, producers, and other gatekeepers serve as important arbiters of meaning. In the case we study, and perhaps in others, if a vanguard with a common understanding of a category constitutes a large enough fraction of the audience, their force alone might be sufficient to drive category differentiation; there might be no need for them to influence the mass audience to have this effect.

What happens if there are multiple vanguards? In our empirical setting, as much as we can tell, we have one vanguard. Insiders are also activists on average, and the prevalence of each is correlated with the prevalence of enthusiasts. If there were stable subsets of vanguard that do not communicate much with each other, that could lead to different category schemas being developed. Medin et al. (1997) find that different kind of tree experts (landscapers, parks maintenance personnel, and taxonomists) have different categorization schemas, consistent with the way in which they work with trees. In such cases, we do not know if the mass audience converges to these different groups and therefore is unable to form a consensus, or if the mass audience picks and chooses from the schemas of various groups of vanguards and reaches a consensus of its own in spite of the conflicting schemas of the vanguard. This, we think, is fertile ground for future research.

Appendix: Notation for Monotonic Relations

Suppose ϕ and ψ are functions defined for a label, an audience member, and a time point. We can denote such a function in the following format: $\phi(l, x, t)$, where l is the label that identifies a population, x refers to a producer/product, and t is a time point. We use the expression $\phi \upharpoonleft \psi$ to indicate a monotonic positive relationship between the two functions.

More precisely, we use the following shorthand:

$$\delta^+(\phi) \leftrightarrow \phi(l, x, t) > \phi(l, x', t');$$
$$\delta^-(\phi) \leftrightarrow \phi(l, x, t) < \phi(l, x', t');$$

and

$$\phi \upharpoonleft \psi \leftrightarrow (\delta^+(\phi) \rightarrow \delta^+(\psi)) \wedge (\delta^0(\phi) \rightarrow \delta^0(\psi)).$$

Across all the applications the number of arguments of the function (its arity), the order of the variables, and the sorts of the variables remain constant. To take advantage of this consistency, we introduce the following notational convention to simplify the representation of the variables of quantification. Let f be a function with the appropriate sequence of sorted variables. (The letter we use to indicate the variable displays the sort.) Instead of spelling out all the variables we just use $\mathbf{q}$ to indicate the appropriate sequence of variables and use $\mathbf{q}'$ for the sequence of the "primed" versions of the variables. For example, if f requires l, y, t, then $f(\mathbf{q}) = f(l, y, t)$ and $f(\mathbf{q}') = f(l', y', t')$.

To express monotonic relationships in a convenient manner first we establish the following convention. Let $\underline{f}$ be a function that works as follows

$$\underline{f}(\mathbf{q}, \mathbf{q}') = \begin{cases} 1 & \text{if } f(\mathbf{q}) > f(\mathbf{q}') \\ 0 & \text{otherwise.} \end{cases}$$

With $\underline{f}(\mathbf{q}, \mathbf{q}')$ given as above, the monotonic positive relationship, $f \upharpoonleft g$, is defined as follows:

$$(f \upharpoonleft g)(\mathbf{q}, \mathbf{q}') \leftrightarrow \underline{f}(\mathbf{q}, \mathbf{q}') = \underline{g}(\mathbf{q}, \mathbf{q}').$$

Table 1: Summary Statistics for Variables

	Mean	SD.	1	2	3	4	5	6	7	8	9	10
1. Prop. items with proper names in title(t)	.593	.346	.168	1.00								
2. No. of subcategories / no. of auctions	20.5	28.0	.123	.469	1							
3. Median no. bids by bidders $[t_0, t)$	1.48	.593	.133	.763	.633	1.00						
4. Prop. bidders who bid on multiple items $[t_0, t)$	.447	.119	.308	.820	.549	.849	1.00					
5. Prop. of bids by top 5% of bidders	.467	.136	.547	.168	.458	.424	.551	1.00				
6. Prop. bidders who also auctioned $[t_0, t)$	.058	.026	.352	.596	.589	.659	.798	.605	1.00			
7. Prop. bidders with cat.-referencing IDs(t)	.065	.064	.296	−.099	.485	.081	.143	.611	.501	1.00		
8. ln(no. of auctions$[t_0, t)$)	13.2	1.06	−.080	.509	.741	.692	.694	.369	.543	.201	1.00	
9. ln(no. of bidders$[t_0, t)$)	12.2	.899	−.317	.511	.527	.513	.514	−.105	.306	−.177	.759	1

Table 2: Effect of Seller's Engagement as an Audience Member on the Log-odds that an Auction Ends with a Sale at Time t (Maximum Likelihood Estimates)

	(1)	(2)
Seller's engagement as an audience member:		
ln(no. items in the category that	.032*	
seller bid on $[t_0, t)$)	(.011)	
Seller bid on an item in the		.133*
category $[t_0, t)$		(.037)
ln(seller's feedback score(t))	.107†	.108†
	(.014)	(.014)
No. of seller's auctions in same category at t	−.011†	−.011†
	(.003)	(.003)
Seller auctions in multiple categories at t	−.508†	−.506†
	(.063)	(.063)
Seller auctioned in multiple categories $[t_0, t)$	−.066	−.073
	(.045)	(.045)
Intercept	−.183	−.193
	(.144)	(1.44)
Category dummies included	Yes	Yes
Ln pseudo-likelihood	−9200	−9203
N	14034	14034

* p < .05 (one−tailed test)
†p < .05 (two-tailed test)
Note: Numbers in parentheses are robust standard errors.

Table 3: Effects of Average Audience Engagement on Label Use and Subclass Differentiation at Time t (Bootstrapped OLS Estimates, N=23)

	Label use		Subclasses	
	(1a)	(1b)	(2a)	(2b)
Average engagement:				
Median no. items bid		.463*		.005
on per bidder $[t_0, t)$		(.118)		(.004)
ln(auctions$[t_0, t)$)	.093	−.092	.002	−.000
	(.074)	(.077)	(.003)	(.003)
ln(bidders$[t_0, t)$)	.113	.122	−.003	−.003
	(.084)	(.076)	(.003)	(.003)
Intercept	−2.02	−.361	.025	.041
	(.805)	(.694)	(.032)	(.035)
Wald X^2	11.13*	45.31*	1.12	2.13

* $p < .05$ (one−tailed test)
†$p < .05$ (two-tailed test)
Note: Numbers in parentheses are bootstrap standard errors.

Table 4: Effect of the Prevalence of the Vanguard on Label Use and Subclass Differentiation at Time t (Bootstrapped OLS Estimates, N=23)

	Label use				Subclasses			
	(1a)	(1b)	(1c)	(1d)	(2a)	(2b)	(2c)	(2d))
Prevalence of activists:								
Prop. bidding on	2.63*				.039*			
multiple items $[t_0, t)$	(.404)				(.020)			
Prop. of bids by the 5%		.462				.036*		
most active $[t_0, t)$		(.865)				(.015)		
Prevalence of insiders:								
Prop. bidders auctioning			6.88*				.204*	
in cat. $[t_0, t)$			(2.51)				(.063)	
Prevalence of enthusiasts								
Prop. bidders with cat.-				−.793)				.087*
referencing IDs $[t_0, t)$				(1.12)				(.026)
ln(no. of auctions$[t_0, t)$)	−.121†	.030	−.031	.132†	−.001	−.003	−.002	−.003
	(.058)	(.147)	(.093)	(.062)	(.002)	(.003)	(.002)	(.001)
ln(no. of bidders$[t_0, t)$)	.125†	.177	.164	.069	−.003	.002	−.001	0.002
	(.043)	(.145)	(.107)	(.111)	(.003)	(.004)	(.002)	(.003)
Intercept	−.507	−2.18	−1.38	−1.93	.047	.012	.043	.015
	(.698)	(.866)	(.855)	(.970)	(.039)	(.032)	(.026)	(.034)
Wald X^2	60.1*	10.96*	17.35*	16.94*	3.93	6.57	12.13*	16.45*

* $p < .05$ (one−tailed test)
†$p < .05$ (two-tailed test)
Note: Numbers in parentheses are bootstrap standard errors.

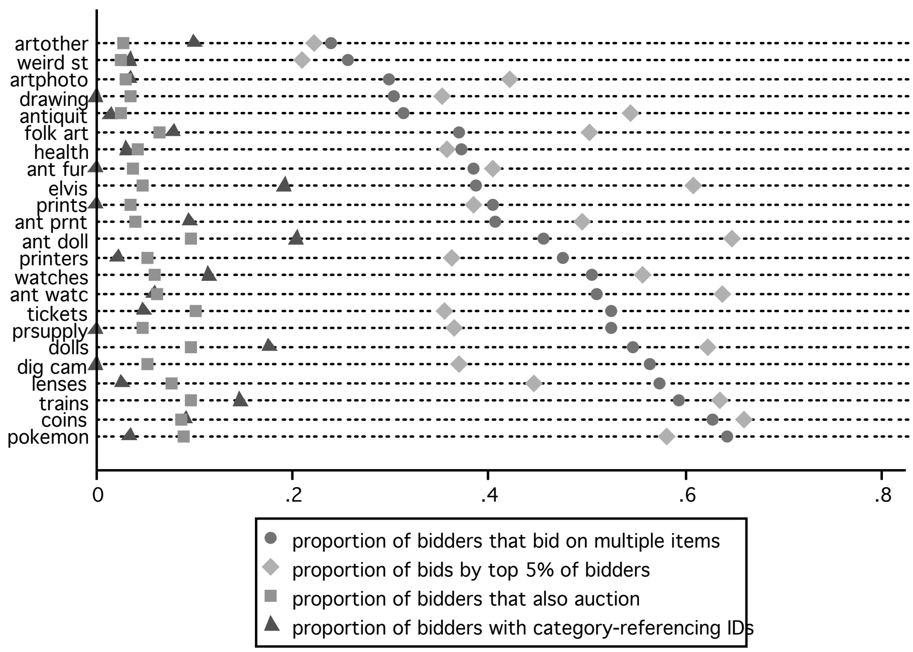

Figure 1: Proportion of Vanguard in Markets

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